

Civil Engineering

EN010301A ENGINEERING MATHEMATICS II
2-2-0 (common to all branches except CS & IT) credits 4

MODULE 1 Vector differential calculus (12 hours)

Scalar and vector fields – gradient-physical meaning- directional derivative-divergence and curl - physical meaning-scalar potential conservative field- identities - simple problems

MODULE 2 Vector integral calculus (12 hours)

Line integral - work done by a force along a path-surface and volume integral-application of Greens theorem, Stokes theorem and Gauss divergence theorem

MODULE 3 Finite differences (12 hours)

(Finite difference operators Δ, ∇, E, μ and δ interpolation using Newtons forward and backward formula – problems using Stirlings formula, Lagrange's formula and Newton's divided difference formula

MODULE 4 Difference Calculus (12 hours)

Numerical differentiation using Newtons forward and backward formula – Numerical integration – Newton's – cotes formula – Trapezoidal rule – Simpsons 1/3rd and 3/8th rule – Difference equations – solution of difference equation

MODULE 5 Z Transforms (12 hours)

Definition of Z transforms – transform of polynomial function and trigonometric functions – shifting property , convolution property - inverse transformation – solution of 1st and 2nd order difference equations with constant coefficients using Z transforms.

Reference

17. Erwin Kreyszing – Advance Engg. Mathematics – Wiley Eastern Ltd.
 18. B.S. Grewal – Higher Engg. Mathematics - Khanna Publishers
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19. B.V. Ramana - Higher Engg. Mathematics – McGraw Hill
20. K Venkataraman- Numerical methods in science and Engg -National publishing co
21. S.S Sastry - Introductory methods of Numerical Analysis - PHI
22. T.Veerarajan and T.Ramachandran- Numerical Methods- McGraw Hill
23. Babu Ram – Engg. Mathematics -Pearson.
24. H.C.Taneja Advanced Engg. Mathematics Vol I – I.K.International

EN010 302 Economics and Communication Skills

(Common to all branches)

Teaching scheme

2 hours lecture and 2 hours tutorial per week

Credits: 4(3+1)

Objectives

To impart a sound knowledge of the fundamentals of Economics.

Economics

Module I (7 hours)

Reserve Bank of India-functions-credit control-quantitative and qualitative techniques

Commercial banks-functions- Role of Small Industries Development Bank of India, and (National Bank for Agriculture and Rural Development)

The stock market-functions-problems faced by the stock market in India (mutual funds)

Module II (6 hours)

Multinational corporations in India-impact of MNC's in the Indian economy. Globalisation necessity (consequences, Privatisation-reasons) disinvestment of public sector undertakings

(The information technology industry in India-future prospects)

Module III (6 hours)

Direct and indirect taxes- impact and incidence- merits of direct and indirect taxes (progressive and regressive taxes- canons of

taxation-functions of tax system- tax evasion reasons for tax evasion in India-consequences-steps to control tax evasion Deficit financing- role-problems associated with deficit financing

Module IV (5 hours)

National income-concepts-GNP, NNP, NI, PI and DPI-methods of estimating national income-difficulties in estimating national income Inflation-demand pull and cost push-effects of inflation-government measures to control inflation

Module V (6 hours)

International trade-case for free trade-case for protectionism Balance of payments-causes of disequilibrium in India's BOP-General Agreement on Tariffs and Trade-effect of TRIPS and TRIMS in the Indian economy-impact of WTO decisions on Indian industry

Text Books

1. Ruddar Datt, Indian Economy, S.Chand and Company Ltd.
2. K.K.Dewett, Modern Economic Theory, S.Chand and Company Ltd.

References

1. Paul Samuelson, Economics, Tata McGraw Hill
2. Terence Byres, The Indian Economy, Oxford University Press
3. S.K.Ray, The Indian economy, Prentice Hall of India
4. Campbell McConnel, Economics, Tata McGraw Hill

Communication Skills

Objectives

- ▶ To improve Language Proficiency of the Engineering students
- ▶ To enable them to express themselves fluently and appropriately in social and professional contexts
- ▶ To equip them with the components of different forms of writing

MODULE – 1 (15 hours)

INTRODUCTION TO COMMUNICATION

Communication nature and process, Types of communication - Verbal and Non verbal, Communication Flow-Upward, Downward and Horizontal, Importance of communication skills in society, Listening skills, Reading comprehension, Presentation Techniques, Group Discussion, Interview skills, Soft skills

MODULE – II (15 hours)

TECHNICAL COMMUNICATION

Technical writing skills- Vocabulary enhancement-synonyms, Word Formation-suffix, affix, prefix, Business letters, Emails, Job Application, Curriculum Vitae, Report writing- Types of reports

**Note: No university examination for communication skills.
There will be internal evaluation for 1 credit.**

REFERENCES

13. The functional aspects of communication skills, P.Prasad and Rajendra K. Sharma, S.K. Kataria and sons, 2007
14. Communication skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning private limited, 2010
15. Professional Communication, Kumkum Bhardwaj, I.K. International (P) House limited, 2008
16. English for technical Communication, Aysha Viswamohan, Tata Mc Graw Publishing company limited, 2008

CE010 303 FLUID MECHANICS

Teaching scheme:

Credits: 4

2 hours lecture and 2 hours tutorial per week

Objective

. This course gives an introduction to the fundamentals of fluid flow and its behavior so as to equip the students to learn related subjects and its application in the day to day life in a very effective manner.

Module 1(12hours)

Properties of fluids: Definition and Units- Mass density, Specific weight, Viscosity – Classification of fluids – Ideal and real fluids, Newtonian and non – Newtonian fluids. **Fluid pressure** – Atmospheric, Absolute, Gauge and Vacuum pressure, Measurement of pressure – Piezometer, manometer, mechanical gauges. Total pressure and centre of pressure on a submerged lamina, pressure on a submerged curved surface – pressure on lock gates, pressure on gravity dams.

Module 2(12hours)

Buoyancy – Centre of buoyancy – Metacentre – Stability of floating and submerged bodies – Determination of metacentric height – Analytical & experimental methods. **Kinematics of fluids** : Methods of describing fluid motion: Lagrangian & Eulerian methods- Types of flow – Streamline, Pathline and Streak line, Velocity potential function, Stream function, Circulation and Vorticity, Laplace's Differential equation in rectangular co-ordinates for two dimensional irrotational flow. **Flow Net** – Orthogonality of stream lines and equipotential lines. Stream tube – continuity equation for one dimensional flow.

Module 3(12hours)

Forces influencing motion – Energy of fluids, Euler's equation, statement and derivation of Bernoulli's equation and assumptions, made. **Applications of Bernoulli's equation** – Venturi meter, Orifice meter, Pitot tube. **Orifices and Mouth Pieces** – Different types of orifices, flow over a sharp edged orifice- flow through large rectangular orifice- flow through submerged orifice (Hydraulic Coefficients-External and internal mouthpiece). **Notches and weirs** – Rectangular, triangular, trapezoidal notches, Cippoletti weir, submerged weir, broad crested weir.

Module 4(12hours)

Flow through pipes: Two types of flow-Laminar and Turbulent flow – Reynold's experiment, (loss of head due to friction) Darcy – Weisbach equation, Other energy losses in pipes. Hydraulic

Gradient and Total Energy Lines: Flow through long pipes – Pipes in series and parallel, Siphon, Transmission of power through pipes – nozzle diameter for maximum power transmission, Laminar

Flow in circular pipes: Hagen poiseuille equation. **Turbulent flow through pipes:** Establishment of flow in pipes-hydro-dynamically smooth and rough boundary, Velocity distribution for turbulent flow in pipes. **Drag and lift for immersed bodies**

Module 5(12hours)

Dimensional Analysis and Model studies: Units and dimensions of physical quantities, Dimensional Homogeneity of formulae and its application to common fluid flow problems, Dimensional Analysis- Rayleigh's method, Buckingham's method, Derivations of dimensionless parameters, Froude's, Reynold's, Webber, Mach numbers.

Hydraulic Models: Need, Hydraulic Similitude, Geometric, Kinematic, Dynamic similarity, Scale ratios of various physical quantities for Froude's and Reynold's model laws – problems, Types of models-Undistorted and Distorted models, Scale effects in models, Spillway models and Ship models.

References

1. Streeter V. L., Fluid Mechanics, Mc Graw Hill, International Students Edition.
2. Dr. P. N. Modi & Dr. S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House Delhi.
3. Jagdishlal, Fluid Mechanics & Hydraulics, Metropolitan Book Co., Delhi.
4. R. J. Garde and A. G. Mirajoker, Engineering Fluid Mechanics, Nem Chand & Bross., Roorkee.
5. Dr. D S Kumar, S K. "Fluid Mechanics and Fluid power Engineering", Kataria & Sons, New Delhi
6. Dr. R.K Bansal, A Text book of Fluid mechanics and Hydraulic machines, Laxmi Publications
7. Douglas, "Fluid mechanics" 4/e Pearson Education.

8. K Subramanya, Fluid Mechanics & Hydraulic Machines, Tata Mc Graw Hill, Education Private Limited New Delhi
9. S Ramamrutham "Hydraulics Fluid Mechanics and Fluid Machines", Dhanpat Rai Publishing Company.

CE010 304: MECHANICS OF SOLIDS I

Teaching scheme:

Credits: 4

3 hour lecture and 1 hour tutorial per week

Objective

• *To understand the strength characteristics of various structural members subjected to axial, bending, shearing and torsional loads*

Module 1(12hours)

Simple stresses and strains: Elastic constants – relation between them – Bars of varying cross section - Deformation due to self weight – Bars of uniform strength - Temperature stresses – Composite members – equilibrium & compatibility conditions. Compound stresses: Two dimensional problems-normal & tangential stresses on an inclined plane - principal stresses and planes-maximum shear stresses & planes – Analytical & Mohr's circle methods.

Module 2(10hours)

Bending moment and shear force: Types of supports, beams & loads - Shear force and Bending moment diagrams for various types of statically determinate beams with various load combinations – relation between load, shear force and bending moment.

Module 3(12hours)

Stresses in beams: Theory of simple bending- modulus of section – bending stress & strain distribution for cross-sections symmetrical about Y-Y axis - built up sections - Composite sections Beams of uniform strength. Shear stresses in beams: shear stress distribution in cross-sections symmetrical about Y-Y axis.

Module 4(14hours)

Stresses due to torsion: Torsion of solid and hollow circular shafts- power transmitted - stresses due to axial thrust, bending and torsion.

Shear centre- shear flow (basic concepts only) Springs: Close coiled and open coiled

Module 5(12hours)

Columns and struts: Short and long columns-Elastic instability-Euler's formula for long columns with various end conditions – effective length - slenderness ratio- limitations - Rankine's formula Combined bending and direct stresses in short columns, Pressure vessels: Thin and thick cylinders- Lamé's equation (derivation not required)- stresses in thick cylinders due to internal pressure.

References

1. Timoshenko.S.P, Strength of Materials, Part-1, D. Van Nostrand company, Inc. Newyork.
2. Nag & Chanda, Fundamentals of Strength of Materials, Wiley India Pvt. Ltd.
3. Bansal R.K., Strength of Materials, Lakshmi Publications, New Delhi.
4. Bhavikatti S.S , Strength of Materials, Vikas Publishing House (P) Ltd.
5. Sadhu Singh, Strength of Materials, Khanna Publishers
6. D.S. Prakash Rao, Strength of Materials, Vol. I, University Press (India) Ltd.
7. Popov E.P., Engineering Mechanics of solids, Prentice Hall of India, New Delhi.
8. Punmia B.C, Strength of Materials, and Mechanics of structures, Vol.1, Lakshmi Publications, New Delhi.
9. Vazirani V.N., Ratwani N. M., Analysis of Structures, Vol.1, Khanna Publishers, New Delhi.
10. Kazimi S.M.A., Solid Mechanics, Tata Mc Graw Hill.
11. Singh, Mechanics of Solids, , Prentice Hall of India, New Delhi.
12. Arthur Morley, Strength of Materials, ELBS, Longman' s Green& Company.
13. T.S.Thandavamoorthy, Analysis of Structures Strength and Behaviour, Oxford University Press, Chennai.

CE010 305 SURVEYING – I

Credits : 4

Teaching Scheme

3 hour lecture and 1 hour tutorial per week

Objective

To ensure that the student develops knowledge of the basic and conventional surveying instruments, principles behind them, working of the instruments, plotting of the area from the field measurements, determination of the area and the theory behind curves.

Module 1 (12hours)

Compass surveying – Prismatic compass – surveyor's compass – bearings – systems and conversions – local attraction – Magnetic declination – dip – traversing – latitude and departure - omitted measurements – errors in compass surveying

Plane table surveying – Accessories - Different methods – radiation, intersection, resection and traversing – two and three point problems and their solutions – advantages and disadvantages - errors

Module 2 (12hours)

Levelling: levels and staves – spirit levelling – bench marks – temporary and permanent adjustments – booking - methods of reduction of levels – arithmetic checks – differential, fly, check and profile leveling - cross sectioning – curvature and refraction – difficulties in leveling - reciprocal levelling – errors in leveling – sensitiveness of bubble tube. Contouring – characteristics and uses of contours – Locating contours- plotting.

Module 3 (13hours)

Theodolite Surveying: Transit theodolite – vernier, micrometer and micro-optic theodolites – description and uses – fundamental lines of a transit theodolite – temporary and permanent adjustments – horizontal angle – reiteration and repetition methods – booking. Vertical angle measurements.

Traversing: Methods of traversing – loose needle and fast needle methods - plotting – closing error - adjustment of closing error by graphical and analytical methods – Bowditch's rule-conditions of

closure – closing error and distribution – Gales traverse table.
Tacheometric surveying: - General principles Stadia method – distance and elevation formulae for staff held vertical – Instruments constants – analytic lens – tangential method – **use of subtense bar.**

Module 4 (10hours)

Areas and volumes Areas – by latitude and departure - meridian distance method – double meridian distance method – co-ordinate method – trapezoidal and Simpson's method – area by planimeter.
Volume – trapezoidal and prismatic rule. Volume from contours. – Capacity of reservoirs – Mass haul curve.

Module 5 (13hours)

Curves: Elements of a simple curve – setting out simple curve by chain and tape methods – Rankine's method – two theodolite method – compound and reverse curve (parallel tangents only) – transition curves – different kinds – functions and requirements – setting out the combined curve by theodolite – elements of vertical curve.

References

1. Dr. B. C. Punmia, Surveying Vol. I & II, Laxmi Publications (P) LTD, New Delhi.
2. T.P. Kanetkar & Kulkarni, Surveying and leveling Vol. I&II A.V.G.Publications, Pune.
3. S.K. Duggal – Surveying Vol I & II Tata Mc Graw Hill Ltd, 2006.
4. Dr. K. R. Arora, Surveying Vol. I, Standard Book House New Delhi.
5. C. Venkatramaiah, Text Book of Surveying, Universities Press (India) LTD. Hyderabad.
6. S.K.Roy, Fundamental of Surveying, Prentice Hall of India, New Delhi.
7. S.K. Hussain & M.S. Nagaraj, Surveying, S.Chand & Company Limited.
8. B.N. Basak – Surveying.
9. Alak De, Plane Surveying, S.Chand &Co.

CE010 306 ENGINEERING GEOLOGY

Teaching scheme:

Credits: 4

3 hour lecture and, 1 hour tutorial per week

Objectives : *To make the students familiar with physical and structural geology as well as the basics of mineralogy and petrology which help them to plan accordingly for the construction of Civil engineering structures.*

Module 1 (10Hrs)

Introduction: Various branches of geology - Relevance of Geology in Engineering. Geologic time scale.

Physical Geology: Geomorphic processes-Rock weathering-Formation of soils, soil profiles-soils of India – Geologic work and engineering significance of rivers and oceans.

Module 2(10Hrs)

Dynamic Geology: Interior constitution of the earth-Variou methods to study the interior-crust, mantle, core-lithosphere-asthenosphere-major discontinuities- Moho, Guttenberg, Lehmann composition of different layers-sima & sial. **Plate tectonics:** Lithospheric plates-diverging, converging and transform boundaries-their characteristic features-midoceanic ridge, benioff zone and transform faults-significance of plate tectonic concept.

Earthquake: Elastic rebound theory-types of seismic waves-cause of earthquake-intensity and magnitude of earthquake-Locating epicentre and hypocenter-effect of earthquake-distribution of earthquake-earthquake resistant structures.

Module 3(14Hrs)

Mineralogy: Definition and classification, important physical properties of minerals-colour, streak, lusture, transperancy, cleavage, fracture, hardness, form, specific gravity and magnetism. Study of the diagnostic physical properties and chemical composition of the following rock forming minerals:

1. Quartz, 2. Feldspar, 3. Hypersthene, 4. Auguite, 5. Hornblende, 6. Biotite, 7. Muscovjite, 8. Olivine, 9. Garnet, 10. Fluorite, 11. Tourmaline, 12. Calcite, 13. Kyanite, 14. Kaolin, 15. Serpentine.

Petrology: Definition and classification-important structures and textures of igneous sedimentary and metamorphic rocks-diagnostic texture, mineralogy, engineering properties and uses of following rocks: Igneous rocks: 1. Granite, 2. Syenite, 3. Diorite, 4. Gabbro, 5. Peridotite, 6. Dolerite, 7. Basalt 8. Pegmatite. Sedimentary rocks: 1. Conglomerate, 2. Breccia, 3. Sandstone, 4. Limestone, 5. shale. Metamorphic rocks: 1. Gneiss, 2. Schist, 3. Slate, 4. Marble, 5. Quartzite, 6. Mylonite, 7. Pseudotachyllite. Special Indian rock types: 1. Charnockite, 2. Khondalite, 3. Laterite.

Module 4(14Hrs)

Structural Geology: Definition-outcrop-stratification-dip and strike. Folds-definition- parts of foldclassification- recognition of folds in the field, Faults-definition- parts of a fault-classificationrecognition in the field-effects of faulting and subsequent erosion on outcrops. Joints-definitionclassification. Unconformities-definition-classification recognition in the field. Effects of all the above described structures in the major engineering projects like reservoirs, dams, tunnels and other important structures.

Module 5(12 Hrs)

Engineering Geology: Mass movement of earth materials-Landslides-definition, classification, causes of land slides and their corrections-Geological considerations in the selection of sites for reservoirs and dams. Geological considerations in Tunnel constructions and mountain roads-rocks as building materials.

Hydrogeology: Groundwater table-abundance and advantages-aquifer-aquicludeaquifuge- artesian conditions and artesian wells-cone of depression- perched water table. **Recommended field work:** Field trip to quarries or geologically significant places to learn - in site character of rocks in quarries/outcrops-measuring strike and dip of a formation-tracing of outcrops.

References

1. Arthur Holmes, Physical geology, Thomas Nelson.
2. Parbin Singh, Engineering & general geology, K.Katria & sons, New Delhi.
3. HH.Read, Rutleys elements of mineralogy, George Allen & Unwin Ltd, London.

4. G.W.Tyrell, Principles of petrology, B.I. Publications, Bombay.
5. M.P.Billings, Structural geology, Aisa publishing house, New Delhi.
6. Krynine&Judd, Engineering geology & geotechniques, Tata McGraw hill, New Delhi.
7. David Keith Todd, Groundwater hydrology, John Wiley & sons, New York.

CE010 307 MATERIAL TESTING LABORATORY - I

Teaching scheme

Credits: 2

3 hours practical per week

Objective: *To study properties of various materials*

List of Experiments

1. Tests on springs (open and close coiled)
2. Bending Test on Wooden Beams using U. T. M.
3. Verification of Clerk. Maxwell's Law of reciprocal deflection and Determination of Youngs modulus 'E' for steel.
4. Torsion Pendulum (M.S. wires. Aluminum wires and brass wires)
5. Tension test using U. T. M. on M. S. Rod, torsteel and High Tensile steel.
6. Torsion Test on M. S, Rod
7. Shear Test on M.S. Rod.
8. Fatigue Test
9. Impact Test (Izod and Charpy)
10. Hardness Test (Brinell, Vicker's and Rebound)
11. Strut Test.

Note : All tests should be done as per relevant BIS.

References

1. Timoshenko.S.P, Strength of Materials, Part-1, D.Van Nostrand company, Inc.Newyork.
2. Bansal R.K., Strength of Materials, Lakshmi Publications, New Delhi.
3. Bhavikatti S.S , Strength of Materials, Vikas Publishing House (P) Ltd.

4. D.S. Prakash Rao, Strength of Materials, Vol. I, University Press (India) Ltd.
5. Popov E.P., Engineering Mechanics of solids, Prentice Hall of India, New Delhi.
6. Punmia B.C, Strength of Materials and Mechanics of structures, Vol.1, Lakshmi Publications, New Delhi.

CE010 308 SURVEYING PRACTICAL- I

Teaching Scheme

Credits :2

3 hours practical per week

Objective: *To impart training in surveying using Chain, Compass, Plane table , Level and theodolite.*

List of Exercises

1. Compass Survey- Traversing with compass and plotting
2. Plane table Survey- Solving Two Point Problem
3. Plane table Survey -Solving Three Point Problem
4. Leveling -Fly leveling- plane of collimation method
5. Leveling- Fly leveling- rise and fall method
6. Leveling -Longitudinal and cross sectioning
7. Leveling -Contour surveying
8. Study of Minor instruments: Planimeter, pantagraph, clinometer, hand levels, Quick setting level, Cylon Ghat Tracer, sextant
9. Theodolite : study of instrument, temporary adjustments, measurement of horizontal and vertical angles.
10. Theodolite surveying - horizontal angle by repetition & reiteration methods.
11. Heights and distances by solution of triangles

References

1. Dr.B.C.Punmia. Surveying Vol. I & II, Laxmi Publications (P) LTD, New Delhi.
2. T.P.Kanetkar & Kulkarni, Surveying and leveling Vol. I&II A.V.G.Publications, Pune.
3. Dr.K.R.Arora, Surveying Vol. I, Standard Book House New Delhi.
4. S. K. Duggal, Surveying Vol I, Mc Graw Hill,